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**U.S. Army  
Environmental  
Center**

## **Dugway Proving Ground Closure Plan Module 3**

**SWMU 48 Accelerated Version**

**Revised Final  
May 1997**

**Contract No. DAAA15-91-D-0010**

Prepared for:  
U.S. Army Environmental Center  
Aberdeen Proving Ground (Edgewood),  
Maryland 21010-5401

Prepared by:



**FOSTER WHEELER ENVIRONMENTAL CORPORATION**

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## EXECUTIVE SUMMARY

This closure plan serves as a decision document to outline the major elements of HWMU 48 closure. The decisions are based on the requirements of the Utah Hazardous Waste Management Rules (the Rules) and the results of nature and extent investigations conducted during Mobilizations 1-3 and early 1997. The major decisions include the following: 1) the gravel covered outdoor storage area at Fries Park will be remediated by excavation of soil and demolition of Building 6040; 2) the contaminated soil will be disposed at a permitted TSCA or RCRA landfill; 3) soils will be sampled after excavation to confirm that contamination has been removed; and 4) Dugway anticipates that the site will either be clean closed or that corrective measures will include contamination reduction and site controls to manage residual risks as described in the Rules (R315-101).

This decision document does not include all the details necessary to carry out closure. Detailed workplans and schedules for excavation of soil, dust control, management of waste, collection of confirmation samples, reporting of analytical results, and placing fills and other necessary plans will be submitted for approval of the Executive Secretary of the Utah Hazardous Waste Control Board after approval of this document. The detailed plans will be approved before Dugway excavates any soil.

Detailed workplans will also address health risks to on-site workers from chemical agent breakdown product contamination in the walls and floor at Building 6042. Until Building 6042 is demolished, it will be clearly designated as a former storage area for 3X decontaminated materials. 3X is an Army designation for materials that have been chemically decontaminated.

RCRA Facility Investigation (RFI) workplans will address the nature and extent of releases of chemical agent decontamination fluids and other liquid wastes from Buildings 6040 and 6042 to the environment. Discharges from the two buildings to the English Village sewage lagoon (HWMU 47) will be addressed in the sludge and soil sampling plans for HWMU 47.

## 20.0 CLOSURE PLAN FOR SWMU 48—FRIES PARK 3X METAL STORAGE AREA

### 20.1 UNIT CHARACTERISTICS

#### 20.1.1 SWMU Description and History

SWMU 48, known as the Fries Park 3X Metal Storage Area, is located near the center of Fries Park, approximately 1 mile west of English Village on the north side of Stark Road (Figure 1.1-1). The unit is also located 2,000 ft northeast of the Fries Park Sewage Lagoon (Corrective Action SWMU 75). The SWMU is located on sloping ground near the south flank of the Cedar Mountains, with an approximate elevation ranging between 4,875 ft msl in the northeast and 4,860 ft msl in the southwest (DPG 1961c).

SWMU 48 is located in the northern portion of the fenced storage yard at Fries Park, between a former trailer park to the west and the Supply Division Warehouse area to the east (Figure 20.1-1) (DPG 1984d). The areal extent of SWMU 48 is defined by four storage buildings, 6014, 6016, 6040, and 6042, of which only 6040 and 6042 are part of the SWMU (Figure 20.1-2). According to comments received from the Utah Division of Solid and Hazardous Waste in January 1997, decontamination solution was disposed in drains in 6042. Building 6040 is a wooden structure in the northwest corner of the yard, while Building 6042 is a reinforced metal building on a concrete pad (Stran-Steel 1953a-d). Just west of Building 6016 are several vent/fill pipes associated with underground storage tanks (USTs) in the area. These underground storage tanks contained heating oil and are not part of the SWMU (EBASCO 1993f). Overall, the SWMU has approximate dimensions of 350 ft by 250 ft.

In operation since 1950, SWMU 48 is located in the part of the Fries Park area that is used for logistics activities and for a storage area of material and equipment, including DS-2 agent decontamination solution and unused agent samplers (Kearney 1989). The DS-2 solution was stored in 5-gallon buckets and 55-gallon PVC drums inside Building 6042 (EDE 1986). In the 1950s when the adjacent trailer park was occupied, Building 6040 was the projection booth and concession stand for an outdoor theater for the trailer park residents. This theater occupied a 100-ft by 50-ft area along the western fence surrounding SWMU 48 (DPG No Date 3; DPG 1951b). Since the theater was closed, SWMU 48 has been used for the storage of waste petroleum, oil, lubricants, glycol, solvents, paints, transformers that apparently contained PCBs, nickel-cadmium batteries, asbestos-contaminated material, and 3X material along with equipment used at DPG. The waste materials have been stored either directly on the gravel-covered ground surface or in various containers that were also placed directly on the gravel (Figure 20.1-3). Waste oil was stored in 55-gallon drums. Because the area was and still is managed by the Director of Logistics, many of the items stored in the SWMU were actually materials being used at DPG, not simply wastes or 3X equipment. However, some of the items were 3X decontaminated (Keetch, Sr. and Mattinson 1995). 3X is an Army designation for materials that have been chemically decontaminated.

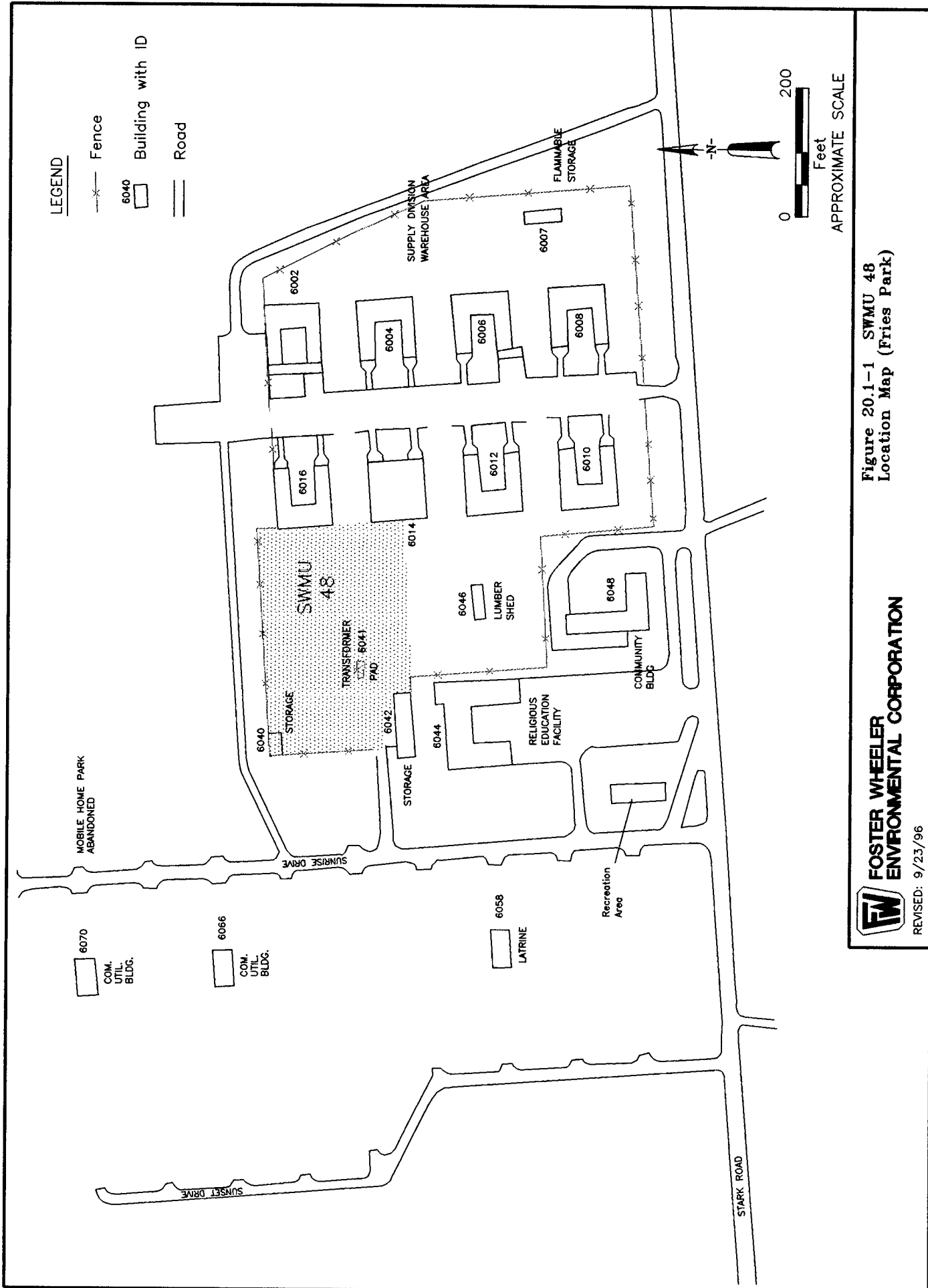
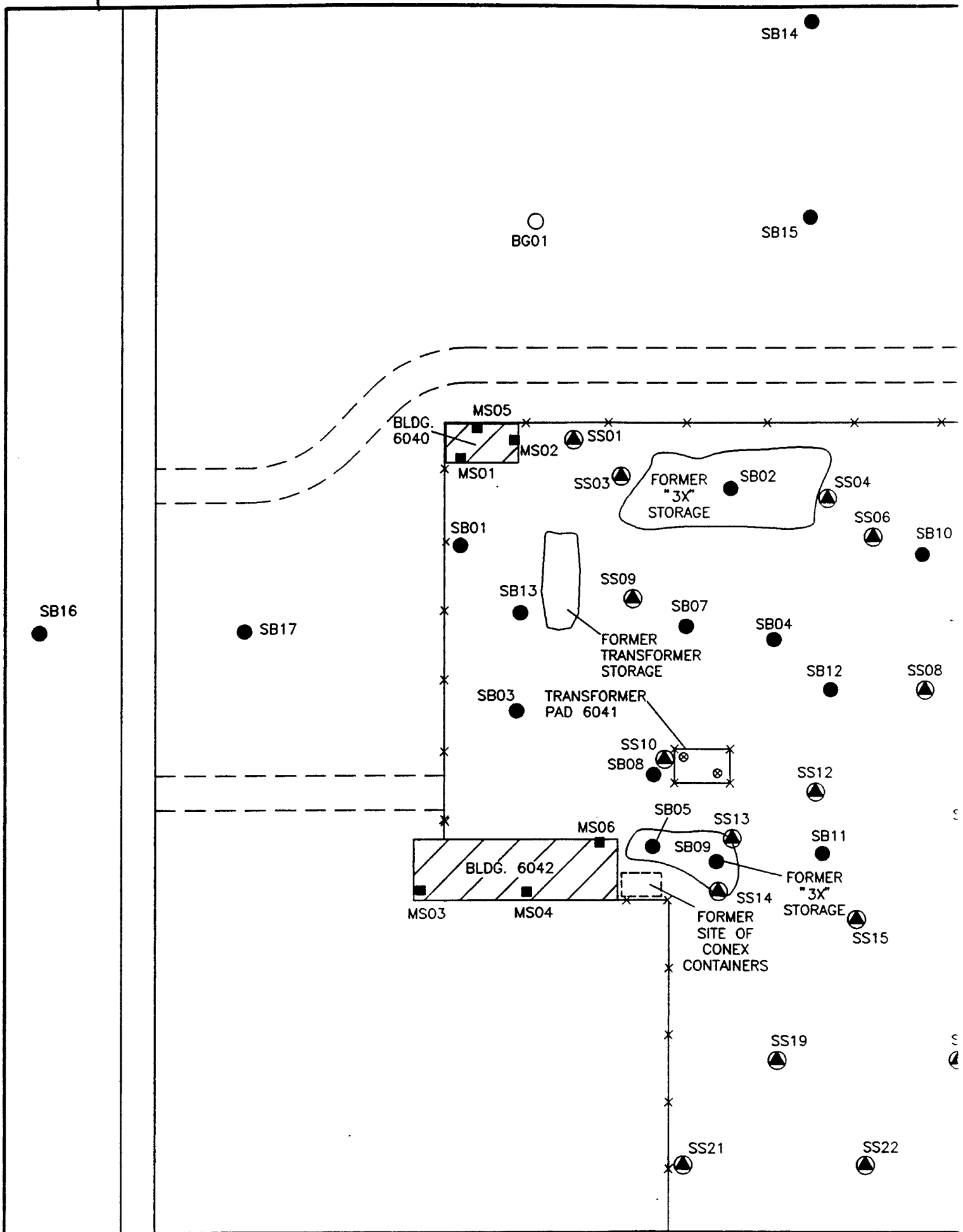


Figure 20.1-1 SWMU 48  
Location Map (Fries Park)

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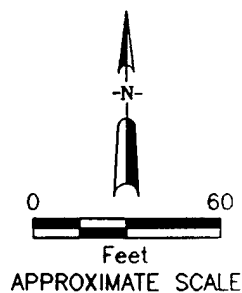
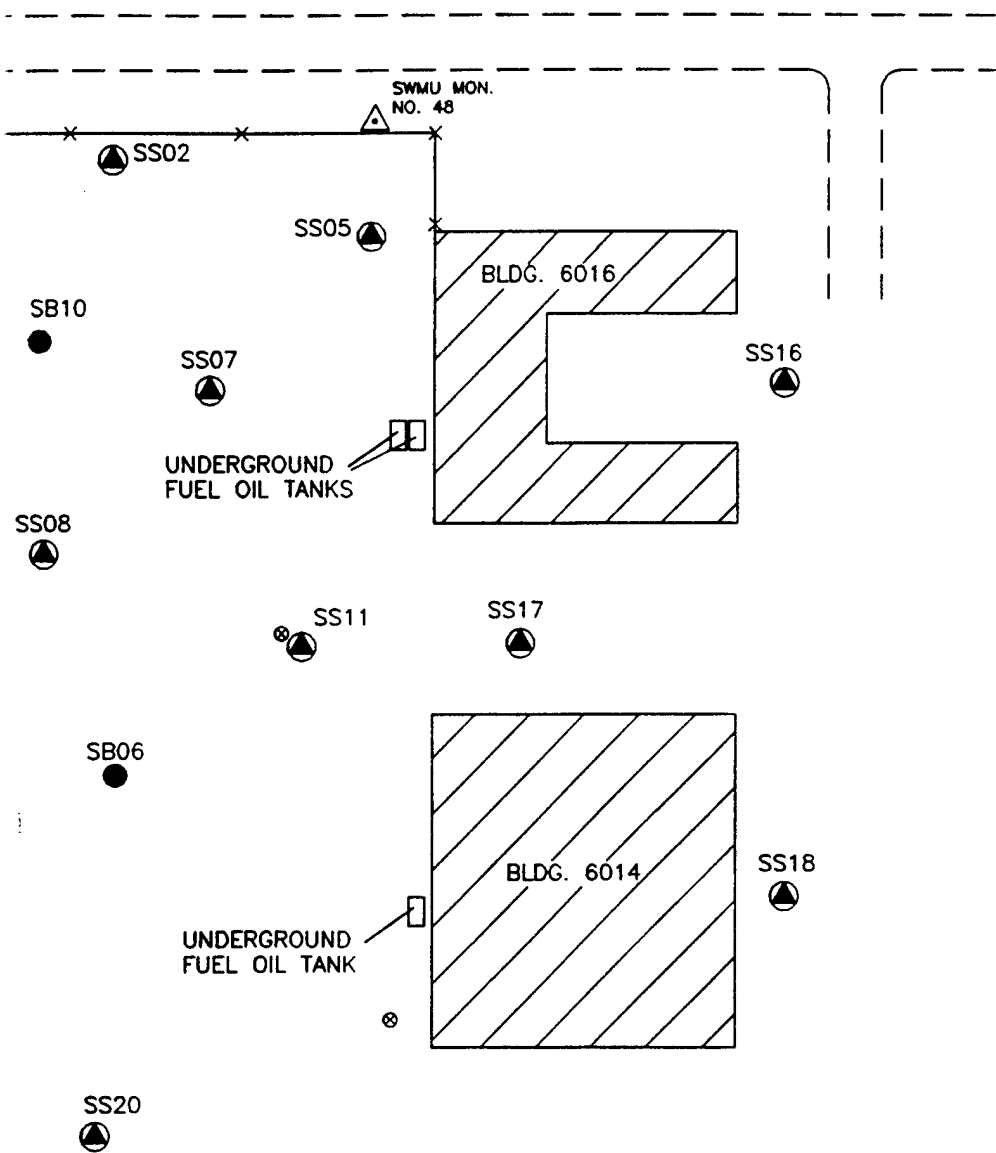
REVISED: 9/23/96



2

# LEGEND

- Soil Boring
- ▲ Surface Soil Sample
- Material Sample
- Background Boring
- △ SWMU Monument
- ⊗ Utility Pole
- ×—× Fence
- ==== Asphalt Road
- - - - - Dirt/Gravel Perimeter Road
- - - - - Buried Piping (Plugged)



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**Figure 20.1-2 SWMU 48  
Sample Location Map**



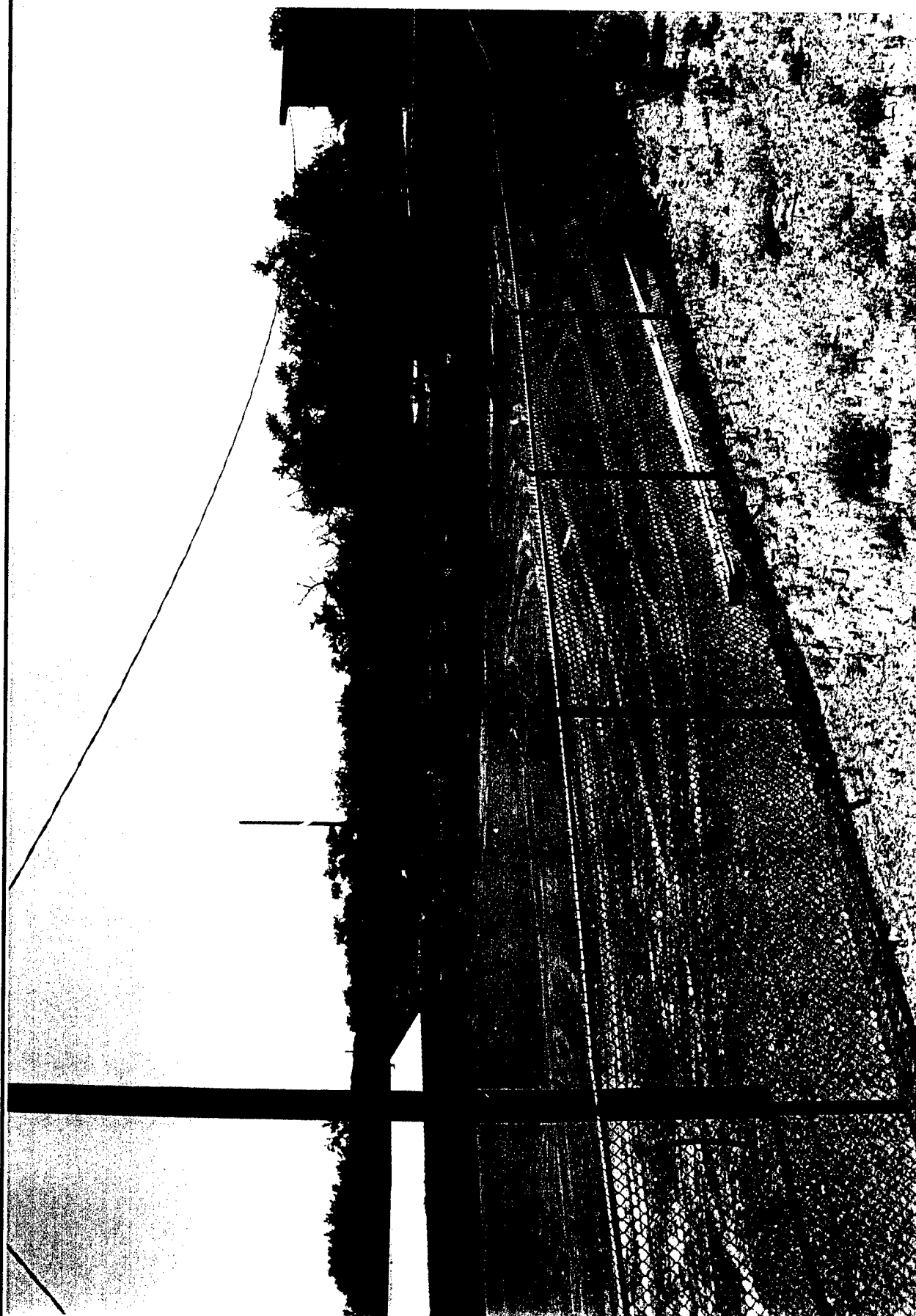


Figure 20.1-3 SWMU 48  
1995 Army Photograph Looking Southwest

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All precise storage locations for 3X materials at the unit since 1950 are unknown, but the majority of 3X material was apparently stored in two areas: one to the east and southeast of Building 6040 and one to the east of Building 6042 (Kearney 1989). These waste storage areas contained a variety of tools and equipment that included screwdrivers, vacuum pumps, and electrical equipment. The 3X material contained in these areas included a bomb dolly, a scale roller, a bomb dispenser, a trailer, hand trucks, decontamination apparatus, a decontamination unit, filter units, a heater, steam cleaners, and an oscilloscope (EDE 1986).

The 3X waste storage area along the northern fence was observed during the pre-Mobilization 1 inspections. The area contained at least three empty cylindrical containers that formerly held Honest John missiles, each of which was approximately 8 ft tall and 3 ft in diameter. Stencils on the containers indicated they had previously been used at Rocky Mountain Arsenal (near Denver, Colorado). A nerve agent (GB) container, apparently empty, was also present, as were several hundred nickel-cadmium batteries. These batteries, none of which appeared to be leaking, were marked 3X and were stacked on wood pallets in the area. None of this material was protected from the elements. By the October 1990 site visit, the material had been removed (EBASCO 1993f).

Nine Conex containers located east of Building 6042 held both asbestos-contaminated material and 3X material; Buildings 6040 and 6042 also were used to store 3X material. Some 3X items stored inside Building 6042 included a laundry truck, cabinets, heaters, amplifiers, a cement mixer, an air conditioner, ladders, electrical equipment, antennae, chemical and biological samplers, a wind-measuring system, a G-agent alarm, and a propane cylinder. The Conex containers held a variety of 3X material, including vacuum pumps, an electrical box, a disassembled shelter, vacuum cleaners, a weld pump, compressor gaskets, and biological samplers (EDE 1986).

Visual site inspections of SWMU 48 were conducted in December 1989 and several times between August and December 1990. SWMU 48 was in operation during this time period, but the contents of the unit varied from one inspection to the next. Material was being stored directly on the ground, on wood pallets and metal grates, and in the Conex containers. Some of the material was marked 3X. The Conex containers were observed east of Building 6042. The Conex containers had approximate dimensions of 10 ft by 10 ft by 8 ft. At least one of these appeared to be empty. Visual inspection of the contents of the other containers was not conducted, but it was noted that the containers provided protection from wind and precipitation. Stained soil was observed in the northeast corner of the site near the location of two UST filling ports near Building 6016. Three overhead wires spanned the site, two of which converged at a transformer pad (Building 6041) that was located in the south-central portion of the SWMU, northeast of Building 6042. The pad was surrounded by a chain-link fence (EBASCO 1993f).

The pad and transformers were removed from the site in 1992 (J. Anderson 1995). The Conex containers were removed after Mobilization 2 field activities in 1993.

### Geophysical Investigation

In December 1989, GPR and EMI geophysical surveys were conducted at SWMU 48 to determine the presence, location, and size of the USTs or any other subsurface features at the site. Total coverage was 1,035 line-ft for the GPR and 2,800 line-ft for the EMI surveys. The GPR data identified three USTs that are approximately 4.5 ft in diameter and 7 ft long. The depth below ground level to the top of the USTs is estimated to be about 1.5 ft to 2 ft. The EMI data, which were collected in an east-west direction, identified two of the three USTs and several underground pipe alignments. Neither survey revealed any evidence of subsurface disposal or activities at SWMU 48 (EBASCO 1993f). Although SWMU 48 is still used by the Supply Division for storage of equipment and other material used at DPG, the yard was empty during a July 1995 inspection. The Director of Logistics plans to continue use of the storage yard in the future as long as DPG is an active military installation.

### 20.1.2 Surface Water and Groundwater

The general direction of surface drainage for the Fries Park area is to the south, away from the Cedar Mountains (Figure 1.1-5). Surface drainage in the area immediately surrounding SWMU 48 is likely influenced by manmade features, including the various buildings, roads, ditches, pads, and the storage yard. Drainage from SWMU 48 is directed by ditches and culverts to the east-west drainage ditches that run parallel to Stark Road, where it is conveyed westward into the Great Salt Lake Desert (EBASCO 1993f).

A detailed description of the geology and soil at SWMU 48 is located in Section 19.1.2 of the Interim Report (EBASCO 1995a). No groundwater monitoring wells have been installed at SWMU 48. The nearest groundwater information comes from monitoring wells at SWMU 47, the English Village Sewage Lagoons. These wells are more than 4,000 ft southwest of SWMU 48. Monitoring wells range in depth from 182.3 (MW3A) to 222.4 ft. (MW01). The principal water-bearing zone for fresh groundwater in these wells occurs in an unconfined aquifer encountered at depths below 175 ft. This aquifer consists mainly of fluvial deposits of clay, sand, and gravel, with angular rock fragments of various compositions. Groundwater flow beneath SWMU 47 is to the east, towards the DPG boundary and Skull Valley.

### 20.1.3 Maximum Extent of Operations

SWMU 48 has been active since the 1950s. The areal extent of the unit was originally defined by four storage buildings (6014, 6016, 6040, and 6042) and had approximate dimensions of 350 ft by 250 ft. During Mobilization 3, sampling extended 200 ft north of the fence line and approximately 120 ft south of Building 6042. The sampling also extended west of the fence line by 200 ft and approximately 120 ft east of Buildings 6014 and 6016. The maximum extent of operations is unknown. SWMU 48 has been used to store a variety of material and equipment for logistics activities. Materials and equipment, such as DS2 decontamination solution, unused agent samplers, waste petroleum products, lubricants and solvents, glycol, paints, transformers, nickel-cadmium batteries, asbestos-contaminated materials, and 3X material and equipment have been stored at SWMU 48. In the past, items were stored directly on the gravel, in containers on the ground, on wooden pallets, or on metal grates. During the most recent inspection of the SWMU (July 1995), the yard was empty. However, DPG personnel plan to continue using the storage yard for storage of materials other than hazardous waste so long as DPG remains an active military installation.

### 20.1.4 Nature and Extent of Contamination

This section presents the results of material and soil sampling during Mobilizations 1 through 3 (1989-1995). Additional sampling is planned in early 1997 for use in corrective action workplan preparation. The sampling program was designed to meet the Army's objective of protecting human health and the environment during continued military use of the area. The sewer system leading from Buildings 6040 and 6042 will be investigated as part of the RFI.

To characterize the nature and extent of contamination at SWMU 48, soil gas, surface, and subsurface soil samples were collected throughout the unit. Ten soil gas samples were collected from SWMU 48. Surface and subsurface soil samples were collected from 17 soil borings and 1 background location, surface soil samples were collected from 22 locations, and 3 material samples were taken from Buildings 6040 and 6042.

#### 20.1.4.1 Material Sampling Results

Wipe samples of dust from inside Buildings 6040 (MS05) and 6042 (MS06) and samples of concrete from both Buildings 6040 (MS01 and MS02) and 6042 (MS03 and MS04) at SWMU 48 were collected during Mobilization 2 to determine whether 3X-related or other contaminants were released onto the floors or other surfaces. Samples were analyzed for SVOCs, pesticides/PCBs, cyanide, agent breakdown products, and RCRA waste characteristics including

toxicity using TCLP protocols, reactivity, corrosivity, and ignitability. Table 20.1-1 summarizes the results of these analyses, and findings are discussed below.

Of the 16 targeted TCLP metals, four were present. Chromium was detected at Building 6040, and arsenic, barium, and selenium were detected at both buildings. All of these metals were detected at concentrations well below the maximum allowed concentrations regulated under 40 CFR 261.2 Subpart C of RCRA.

One TCLP VOC, chloroform, was detected in the material samples from both Buildings 6040 and 6042 at concentrations ranging from 2.5 to 2.8 µg/l. These concentrations are well below regulatory levels. SVOCs, bis(2-ethylhexyl) phthalate, and nontarget analytes palmitic acid and stearic acid were found only in the one dust sample at Building 6040 (MS05). Agent breakdown products chloroacetic acid, DIMP, thiodiglycol, and MPA were detected at two sample locations (MS05 and MS06). All debris, liquid or soil generated during closure that is contaminated with chemical agent breakdown products will be managed as F999 hazardous waste (UAC R315-2-10(e)(1)). None of the samples collected exhibited the characteristics of ignitability, reactivity, or corrosivity.

#### 20.1.4.2 Soil Sampling Results

Soil samples were collected from 6 soil borings, 15 surface soil sample locations, and 1 background boring during Mobilization 2. The sampling locations were scattered across the SWMU in areas where storage may have occurred. SB02 and SB05 and SS13 and SS14 were located in areas of documented 3X storage. During Mobilization 3, an additional 11 soil borings were drilled and 7 surface soil samples were collected to evaluate the extent of contamination at SWMU 48. Soil samples were analyzed for total metals, VOCs, SVOCs, pesticides, and agent-breakdown products. In addition, six samples collected during Mobilization 3 were analyzed for dioxins and furans.

#### Inorganic Constituents

Cadmium, chromium, copper, mercury, lead, vanadium, and zinc were all selected as potential COPCs at SWMU 48 based on the ANOVA comparison and detections exceeding the 95% UTL background value or ecological risk. The spatial distribution of inorganic constituents at SWMU 48 is shown in Figure 20.1-4.

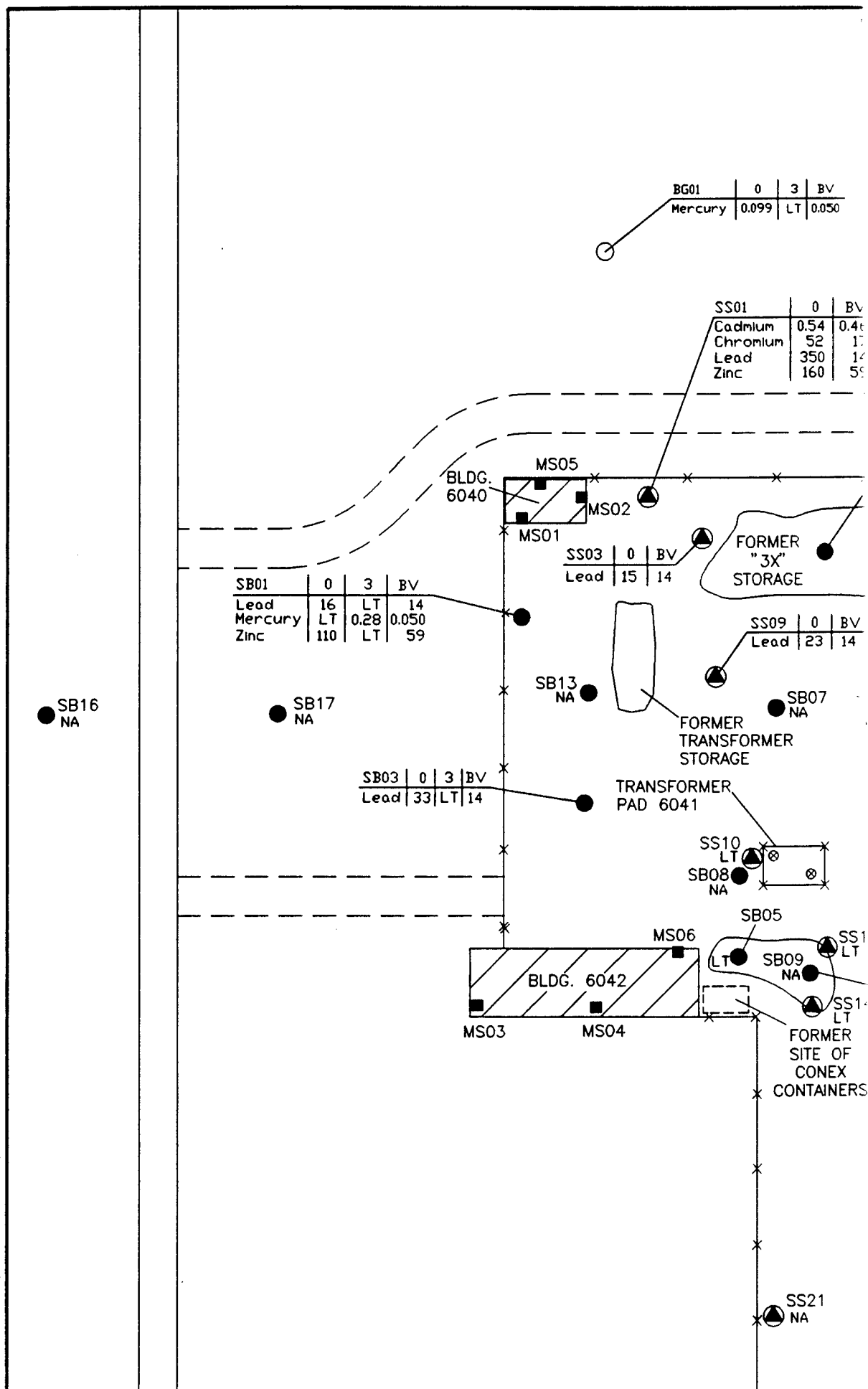
Mercury was detected in 6 of 29 soil samples. Each detection occurred at concentrations exceeding the 95% UTL background value. The maximum mercury detections were 0.13 µg/g

Table 20.1-1 Summary of SWMU 48 Material Sample Results<sup>1</sup>

Page 1 of 1

Material Sample	Location	Physical State	RCRA Characterisitic	Analytical Results	Regulatory Levels
MS01	Building 6040	Solid Waste (Concrete)	pH-corrosivity	12.2	<2 or >12.5
			Ignitability	>60°C	<60°C
			Reactive cyanide	<250 Tg/g	250 Tg/g
			Reactive sulfide	<500 Tg/g	500 Tg/g
			Arsenic	110 Tg/l	5000Tg/l
			Barium	770Tg/l	100000Tg/l
			Chloroform	2.8Tg/l	6000Tg/l
			Chromium	16Tg/l	5000Tg/l
MS02	Building 6040	Solid Waste (Concrete)	pH-corrosivity	12.2	<2 or >12.5
			Ignitability	60°C	<60°C
			Reactive cyanide	<250 Tg/g	250 Tg/g
			Reactive sulfide	<500 Tg/g	500 Tg/g
			Arsenic	130Tg/l	5000Tg/l
			Barium	840Tg/l	100000Tg/l
			Selenium	100Tg/l	1000Tg/l
MS03	Building 6042	Solid Waste (Concrete)	pH-corrosivity	12.3	<2 or >12.5
			Ignitability	>60°C	<60°C
			Reactive cyanide	<250Tg/g	250Tg/g
			Reactive sulfide	<500Tg/g	500Tg/g
			Arsenic	120Tg/l	5000Tg/l
			Barium	810Tg/l	100000Tg/l
			Chloroform	2.5Tg/l	6000Tg/l
			Selenium	100Tg/l	1000Tg/l
MS04	Building 6042	Solid Waste (Concrete)	pH-corrosivity	12.3	<2 or >12.5
			Ignitability	60°C	<60°C
			Reactive cyanide	250 Tg/g	250 Tg/g
			Reactive sulfide	500 Tg/g	500 Tg/g
			Arsenic	130Tg/l	5000Tg/l
			Barium	790Tg/l	100000Tg/l
			Chloroform	2.7Tg/l	6000Tg/l
			Selenium	120Tg/l	1000Tg/l
MS05	Building 6040	Wipe	Bis(2-ethylhexyl) phthalate	0.2Tg/c <sup>2</sup>	NA
			Chloroacetic acid	1.3 Tg/g	NA
			DIMP	.203 Tg/g	NA
			Palmitic acid	100Tg/c <sup>2</sup>	NA
			Stearic acid	60µg/c <sup>2</sup>	NA
			Thiodiglycol	4.61 Tg/g	NA
MS06	Building 6042	Wipe	Chloroacetic acid	1.34 Tg/g	NA
			DIMP	.203 Tg/g	NA
			MPA	1.53 Tg/g	NA
			Thiodiglycol	4.61 Tg/g	NA

<sup>1</sup> Hazardous waste designations are based on criteria specified in 40 CFR 261 Subpart C. These criteria define characteristics of ignitability (D001) as flashpoint <60° C; corrosivity (D002) as an aqueous sample with pH ≤2 or ≥12.5, or a liquid which corrodes steel at a rate >6.35 mm/yr; reactivity (D003) as cyanide >250 mg/kg or sulfide >500 mg/kg; and toxicity (D004-43), for which regulatory levels and hazardous waste numbers are listed in Table 1 of Subpart C (Part 261.24).



SB14  
NA

BG01	0	3	BV
Mercury	0.099	LT	0.050

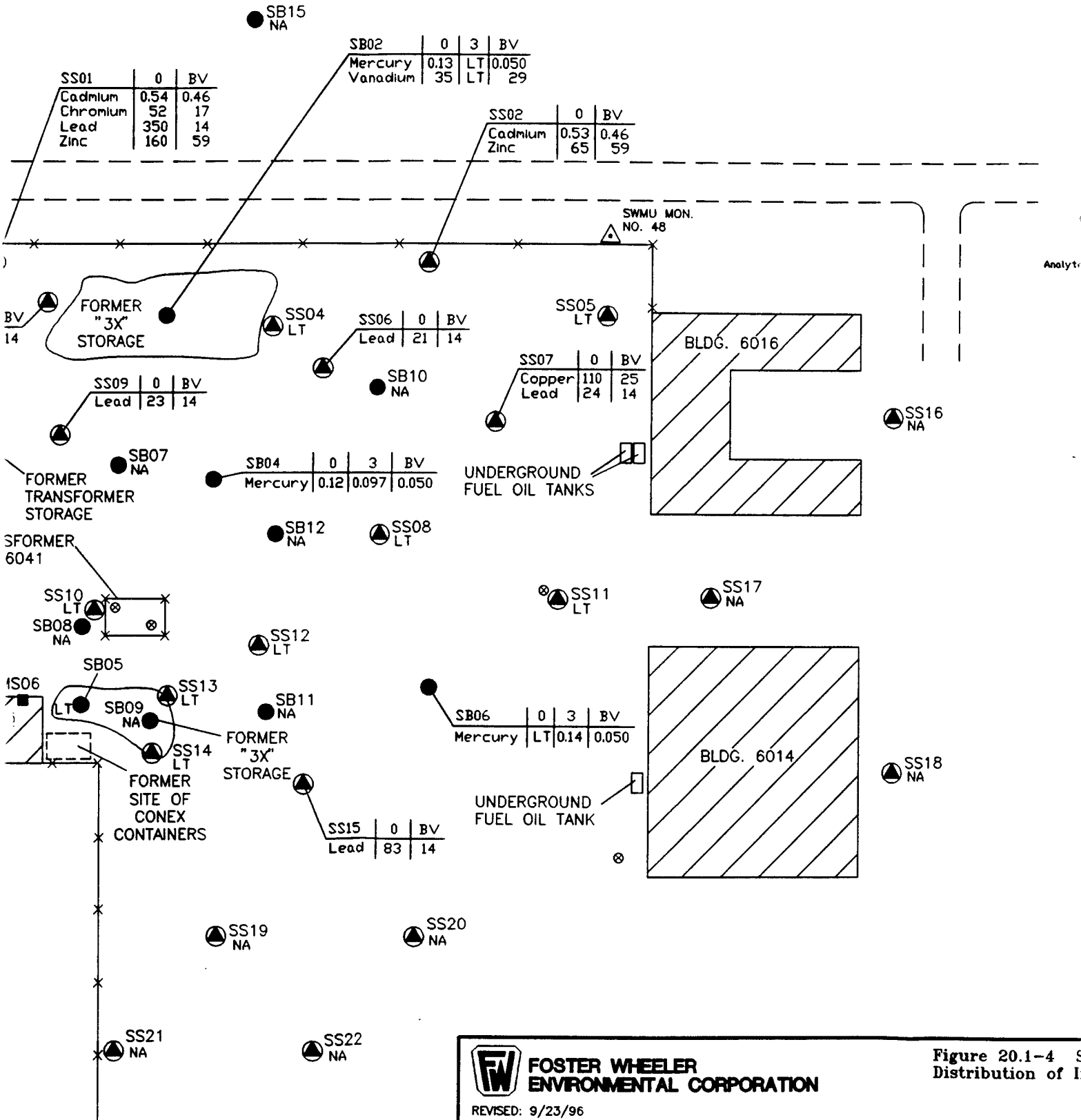


Figure 20.1-4 S  
Distribution of I:

2



# LEGEND

- Soil Boring
- ⊙ Surface Soil Sample
- Material Sample
- Background Boring
- △ SWMU Monument
- ⊗ Utility Pole

- ×——× Fence
- ==== Asphalt Road
- Dirt/Gravel Perimeter Road
- - - - Buried Piping (Plugged)

● Depth in feet

Analyte	Chromium	214	19	BV	Background Value
	Mercury	.26	.099		Analyte concentrations in blue are detections above background value in ug/g

LT - Less than Method Detection Limit or BV  
 NA - Not Analyzed  
 ug/g - Micrograms Per Gram

SS16  
NA

SS18  
NA

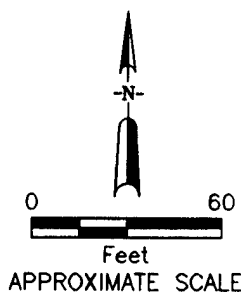


Figure 20.1-4 SWMU 48  
 Distribution of Inorganics in Soil

in the surface soil (SB02) and 0.28 µg/g in the subsurface soil (SB01). The 95% UTL background value for mercury at DPG is 0.05 µg/g. Concentrations in two soil samples (surface sample at the background soil boring and at the 3-ft to 4-ft interval at SB04) were less than twice the 95% background value. All other detections were at concentrations between 2.4 times and 5.6 times the background value. Although the presence of mercury at SWMU 48 is most likely the result of SWMU activities, the spatial distribution shows no trend.

Lead was detected in 29 of 29 soil samples collected at SWMU 48. Eight samples exceeded the 95% UTL background value. Lead was detected at concentrations significantly greater than the background value in only two samples (SS01 and SS15). The distribution of lead appears to be random throughout the SWMU.

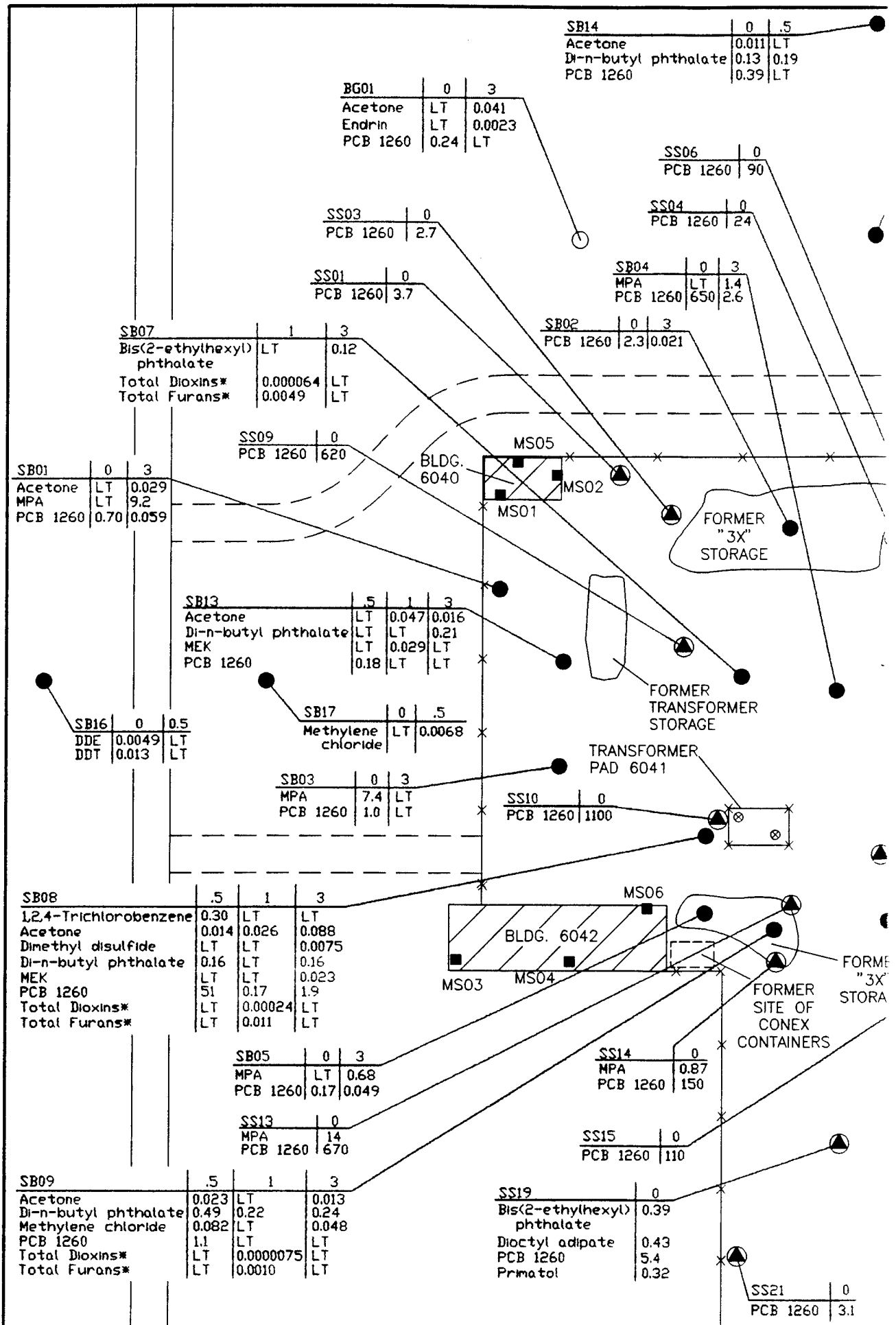
Cadmium, chromium, copper, vanadium, and zinc were at concentrations exceeding the 95% UTL background value in three or less samples. The background exceedances of these constituents all occurred in the northern third of the SWMU. The spatial distribution of these constituents shows no trend. Metals and all other contaminants of concern will be included as parameters in the confirmation sampling program.

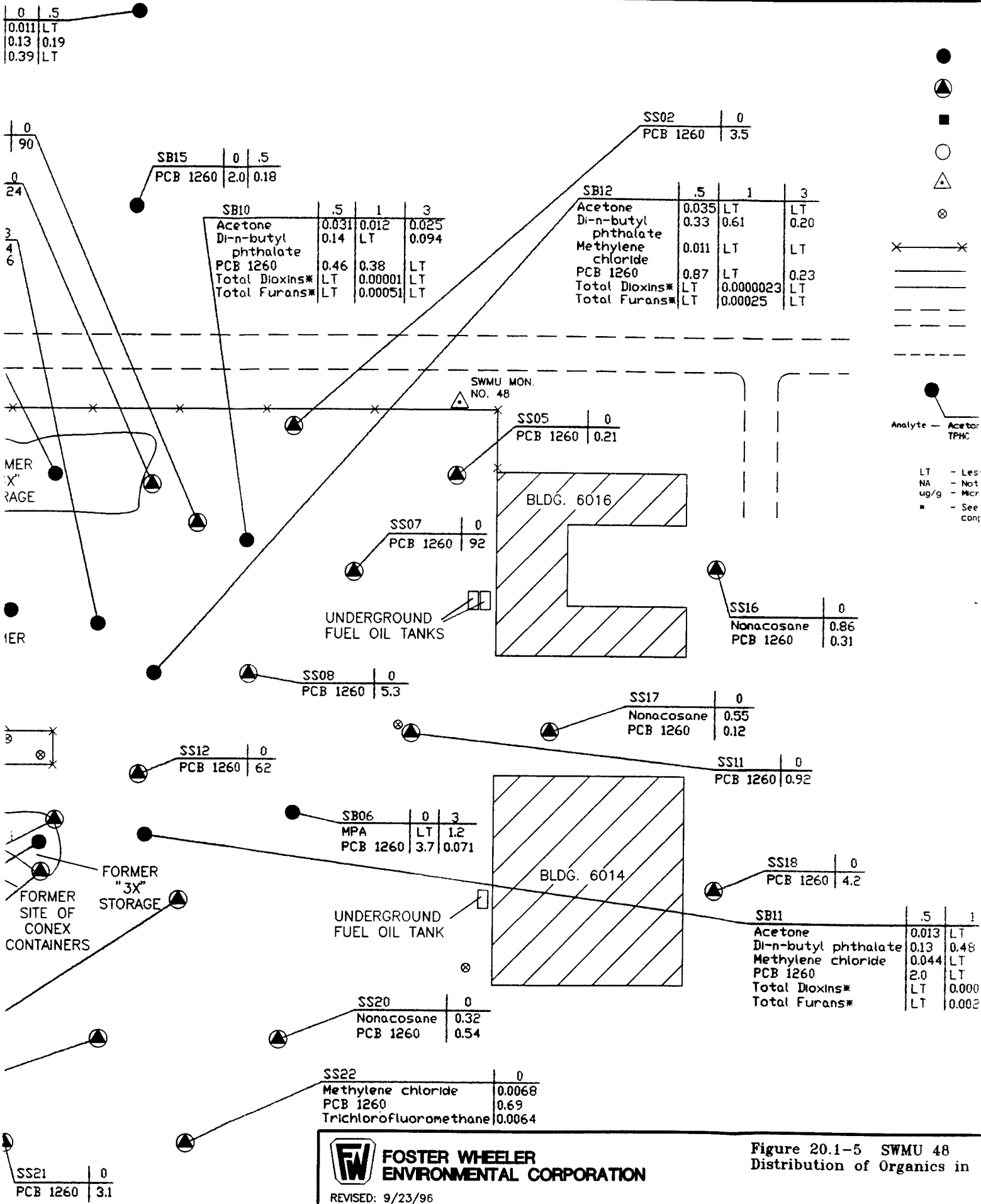
#### Organic Constituents

Organic constituents detected in SWMU 48 soil include VOCs, SVOCs, pesticides, PCBs, dioxins/furans, agent breakdown products, and nontarget compounds. Because the presence of organic compounds can indicate human activity, all organic constituents detected were considered to be potential COPCs. The distribution of organic constituents in soil is shown on Figure 20.1-5.

The VOCs detected at SWMU 48 include acetone, methylene chloride, and methyl ethyl ketone (MEK). In addition, two nontarget VOCs (dimethyl disulfide and trichlorofluoromethane) were detected in soil at SWMU 48. Acetone was detected in 15 of 39 samples. Methylene chloride was detected in 6 of 26 samples at low concentrations. These detections could be the result of laboratory contamination rather than site-related activity. MEK was detected in 2 of 41 samples from locations on the western side of the SWMU (SB08 and SB13). Both of these detections occurred in subsurface soil samples and may be related to site activities. The nontarget compound dimethyl disulfide was detected in one subsurface soil sample on the western side of the SWMU (SB08). This compound is commonly associated with decaying organic matter and may be naturally occurring in soil (Graedel; Micromedex). Trichlorofluoromethane, another nontarget analyte, was detected at a very low concentration in one surface soil sample (SS22). This compound is associated with aerosols and may not be related to SWMU activity.

The SVOCs detected in soil at SWMU 48 include phthalates (bis (2-ethylhexyl) phthalate and di-n-butyl phthalate), 1,2,4-trichlorobenzene, and nontarget analyses (dioctyl adipate and nonacosane). Bis(2-ethylhexyl) phthalate was detected in 2 of 44 samples and di-n-butyl





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Figure 20.1-5 SWMU 48  
Distribution of Organics in

# LEGEND

- Soil Boring
- ▲ Surface Soil Sample
- Material Sample
- Background Boring
- △ SWMU Monument
- ⊗ Utility Pole

- ×——× Fence
- ===== Asphalt Road
- Dirt/Gravel Perimeter Road
- Buried Piping (Plugged)

Analyte	Acetone	10	Depth in feet
	TPHC	0.02	Analyte concentrations in blue are detections in ug/g
		87	

- LT - Less than Method Detection Limit
- NA - Not Analyzed
- ug/g - Micrograms Per Gram
- \* - See Table 201-2 for dioxin/furan congener concentrations

SS02	0
PCB 1260	3.5

	.5	1	3
yl	0.035	LT	LT
late	0.33	0.61	0.20
ne	0.011	LT	LT
de			
0	0.87	LT	0.23
oxins*	LT	0.0000023	LT
rans*	LT	0.00025	LT



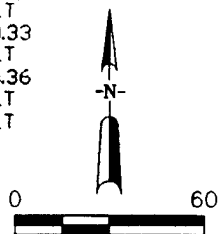
SS16	0
Nonacosane	0.86
PCB 1260	0.31

SS17	0
Nonacosane	0.55
PCB 1260	0.12

SS11	0
PCB 1260	0.92

SS18	0
PCB 1260	4.2

	.5	1	3
Acetone	0.013	LT	LT
Di-n-butyl phthalate	0.13	0.48	0.33
Methylene chloride	0.044	LT	LT
PCB 1260	2.0	LT	0.36
Total Dioxins*	LT	0.00045	LT
Total Furans*	LT	0.0020	LT



Feet  
APPROXIMATE SCALE

Figure 20.1-5 SWMU 48  
Distribution of Organics in Soil

phthalate was detected in 16 of 40 samples. Both compounds were detected in surface and subsurface soil. These two phthalates and the nontarget analyte dioctyl adipate (detected in one surface soil sample) are associated with plastics. These constituents could be the result of sampling or laboratory contamination. The solvent 1,2,4-trichlorobenzene was detected in one surface soil sample taken near the transformer pad (SB08). This constituent may be present as a result of SWMU activities. One nontarget SVOC (nonacosane) was detected in the surface soil samples at three locations (SB16, SB17, and SB20). This long-chain hydrocarbon could be associated with fuel or vehicle exhaust.

PCB 1260 was detected in all but three locations, including the background boring (BG01). Aroclor 1260 was not detected in SB07, SB16, and SB17. The highest concentrations were found in the central portion of the site. It appears PCB 1260 contamination occurs at the 3-ft to 4-ft depth interval primarily in the central and south-central region of the SWMU (SB08, SB11, and SB12).

Sampling during Mobilization 3 was designed to better define the areal and vertical extent of PCB 1260 contamination. The areal extent to the west of the SWMU appears to be defined, but the maximum geographical extent in the other three directions has still not been delineated. In addition, the vertical extent of PCB 1260 contamination has not yet been clearly defined. It is possible that there was a leak or spill in the vicinity of the transformer pad that was subsequently spread around the SWMU when vehicles were driven through the area. It is also possible that oil containing PCBs was spread in the area as a means of suppressing dust.

Dioxin and furan samples were collected at the 1-ft to 2-ft depth at six boring locations (SB07 through SB12) (Table 20.1-2). The dioxin HpCDD and the furan HpCDF were detected at all six locations, although only one concentration (SB08) exceeded the residential RBSL. The dioxin HxCDD was detected at all the locations except SB12, and the residential RBSL was exceeded only at SB11. The furan HxCDF was detected at all of the locations. These detections exceeded both the residential and industrial RBSLs at all locations except SB12, where only the residential RBSL was exceeded. The dioxin OCDD was detected at three locations (SB07, SB08, and SB11). The furan OCDF was detected at the same three locations and also at SB12. None of these detections exceeded the RBSLs for the dioxin OCDD or the furan OCDF. The dioxin PeCDD was detected only at SB11 and exceeded both RBSLs. The dioxin TCDD was detected at SB08 and SB11 at concentrations that were less than the residential and industrial RBSLs. The furans PeCDF and TCDF were detected at all six locations in concentrations exceeding both RBSLs. Additional information about the nature and extent of dioxin contamination was obtained

Table 20.1-2 Summary of SWMU 48 Dioxin and Furan Results

Page 1 of 1

Sample	Dioxin	Depth	Analytical Results	Furan	Depth	Analytical Results
048SB07	HpCDD	1.0	0.000015 Tg/g	HpCDF	1.0	0.00015 Tg/g
	HxCDD	1.0	0.0000026 Tg/g	HxCDF	1.0	0.0012 Tg/g
	OCDD	1.0	0.000046 Tg/g	OCDF	1.0	0.000027 Tg/g
				PeCDF	1.0	0.0023 Tg/g
				TCDF	1.0	0.0012 Tg/g
048SB08	Total Dioxins	1.0	0.000064 Tg/g	Total Furans	1.0	0.0049 Tg/g
	HpCDD	1.0	0.000056 Tg/g	HpCDF	1.0	0.00035 Tg/g
	HxCDD	1.0	0.00001 Tg/g	HxCDF	1.0	0.0024 Tg/g
	OCDD	1.0	0.00017 Tg/g	OCDF	1.0	0.00023 Tg/g
	TCDD	1.0	0.0000015 Tg/g	PeCDF	1.0	0.0054 Tg/g
048SB09				TCDF	1.0	0.0031 Tg/g
	Total Dioxins	1.0	0.0000069 Tg/g	Total Furans	1.0	0.011 Tg/g
	HpCDD	1.0	0.00000057 Tg/g	HpCDF	1.0	0.000036 Tg/g
	HxCDD	1.0		HxCDF	1.0	0.00029 Tg/g
				PeCDF	1.0	0.00048 Tg/g
SB10				TCDF	1.0	0.00022 Tg/g
	Total Dioxins	1.0	0.0000075 Tg/g	Total Furans	1.0	0.001 Tg/g
	HpCDD	1.0	0.0000096 Tg/g	HpCDF	1.0	0.00025 Tg/g
	HxCDD	1.0	0.00000071 Tg/g	HxCDF	1.0	0.00015 Tg/g
				PeCDF	1.0	0.00024 Tg/g
SB11				TCDF	1.0	0.0001 Tg/g
	Total Dioxins	1.0	0.00001 Tg/g	Total Furans	1.0	0.00051 Tg/g
	HpCDD	1.0	0.000081 Tg/g	HpCDF	1.0	0.000054 Tg/g
	HxCDD	1.0	0.00011 Tg/g	HxCDF	1.0	0.00037 Tg/g
	OCDD	1.0	0.00023 Tg/g	OCDF	1.0	0.000026 Tg/g
SB12	PeCDD	1.0	0.000028 Tg/g	PeCDF	1.0	0.00083 Tg/g
	TCDD	1.0	0.0000011 Tg/g	TCDF	1.0	0.00068 Tg/g
	Total Dioxins	1.0	0.00045 Tg/g	Total Furans	1.0	0.002 Tg/g
	HpCDD	1.0	0.0000023 Tg/g	HpCDF	1.0	0.0000058 Tg/g
				HxCDF	1.0	0.000056 Tg/g
				OCDF	1.0	0.000003 Tg/g
				PeCDF	1.0	0.000013 Tg/g
				TCDF	1.0	0.000055 Tg/g
	Total Dioxins	1.0	0.0000023 Tg/g	Total Furans	1.0	0.00025 Tg/g

from soil sampling during early 1997. The 1997 sample results will be presented for approval in the detailed workplans.

Three pesticides were detected in one sample at low concentrations. Endrin was detected in the subsurface sample from the background boring (BG01), and DDE and DDT were detected in the surface sample from boring SB16. Primatal, a nontarget compound, was detected in one surface soil sample (SS19). Primatal is a herbicide that was probably applied at the SWMU.

#### Explosives and Agent Breakdown Products

One agent breakdown product, MPA, was detected in seven locations: at three locations in the southern 3X storage area (SS13, SS14, and SB05), at one location in the storage yard east of the southern 3X storage area (SB06), at two locations in the western part of the yard (SB01 and SB03), and at one location in the center of the storage yard (SB04). These MPA detections were measured during analysis of Mobilization 2 soil samples. No chemical agent breakdown products were detected during Mobilization 3. No explosives were detected at SWMU 48.

#### 20.1.5 Baseline Human Health Risk Assessment

The baseline human health risk assessment is based on the soil analytical results presented in Section 20.1.4 and the risk assessment approach described in Section 4. As required by Utah Administrative Rule R315-101, this approach provides a conservative evaluation of potential health risks associated with both a residential and industrial use of SWMU 48.

##### 20.1.5.1 Identification of Potential COPCs

With the use of the conservative selection criteria defined in Section 4 and depicted on Figure 4.2-1, the following 23 constituents were selected as soil COPCs for SWMU 48 (Table 20.1-3):

- |                               |                      |
|-------------------------------|----------------------|
| • Acetone                     | • Methylene Chloride |
| • Bis(2-ethylhexyl) phthalate | • OCDD               |
| • Trichlorofluoromethane      | • OCDF               |
| • Dimethyl disulfide          | • PCB-1260           |
| • Di-n-butyl phthalate        | • PPDDE              |
| • Dioctyl adipate             | • PPDDT              |
| • HpCDD                       | • Prometon           |
| • HpCDF                       | • PeCDD              |
| • HxCDD                       | • PeCDF              |
| • HXCDF                       | • TCDD               |
| • MEK                         | • TCDF               |
| • MPA                         |                      |



Table 20.1-3 Summary of Constituents Detected in SWMU 48 Soil Samples and Identification of COPCs

Constituent	Detection Frequency		Percent Detections	EPC			ANOVA COPC	Essential Nutrient	Few De- tections > UTL	EPC Less Than RBSL*	Evidence of Histor- ical Use	Select- ed as COPC
	No. of Samples	No. of Detections		Maximum (ug/g)	95% UCL (ug/g)	UTL (ug/g)						
1,2,4-Trichlorobenzene	60	1	2	0.3	0.12	--	No	--	--	--	--	No
Acetone	39	15	38	0.088	0.019	--	No	--	--	--	--	Yes
Aluminum	29	29	100	8700	670	19000	No	--	--	--	--	No
Antimony	29	1	3	7	2.9	9.1	No	--	--	--	--	No
Arsenic	21	21	100	10	5.2	13	No	--	--	--	--	No
Barium	29	29	100	180	110	400	No	--	--	--	--	No
Beryllium	29	1	3	0.61	0.28	1	No	--	--	--	--	No
Bis(2-ethylhexyl) phthalate	44	2	5	0.39	0.1	--	--	No	--	--	--	Yes
Cadmium	29	2	7	0.54	0.29	0.46	No	--	--	--	--	No
Calcium	29	29	100	140000	56000	190000	No	Yes	--	--	--	No
Chromium	29	29	100	52	16	17	Yes	No	Yes	Yes	No	No
Cobalt	29	22	76	3.1	2.5	7.9	No	No	--	--	--	No
Copper	29	29	100	110	18	25	No	Yes	--	--	--	No
Di-n-butyl phthalate	40	16	40	0.61	0.2	--	--	No	--	--	--	Yes
Dimethyl disulfide	1	1	100	0.0075	0.008	--	--	No	--	--	--	Yes
Diethyl adipate	1	1	100	0.43	0.43	--	--	No	--	--	--	Yes
Endrin	62	1	2	0.0023	0.017	--	--	No	--	--	--	No
HpCDD	6	6	100	8.1E-05	5.5E-05	--	--	No	--	--	--	Yes
HpCDF	6	6	100	0.00035	0.00021	--	--	No	--	--	--	Yes
HxCDD	6	5	83	0.00011	5.6E-05	--	--	No	--	--	--	Yes
HxCDF	6	6	100	0.0024	0.0015	--	--	No	--	--	--	Yes
Iron	29	29	100	10000	8300	19000	No	Yes	--	--	--	No
Lead	29	29	100	350	44	14	No	No	--	--	--	No
MEK	41	2	5	0.029	0.007	--	--	No	--	--	--	Yes
MPA	63	7	11	14	1.2	--	--	No	--	--	--	Yes
Magnesium	29	29	100	28000	11000	29000	No	Yes	--	--	--	No
Manganese	29	29	100	230	150	520	No	No	--	--	--	No
Mercury	29	6	21	0.28	0.082	0.05	No	No	--	--	--	No
Methylene chloride	26	6	23	0.082	0.016	--	--	No	--	--	--	Yes
Nickel	29	29	100	8.5	5.5	17	No	Yes	--	--	--	No
OCDD	3	3	100	0.00023	0.0003	--	--	No	--	--	--	Yes
OCDF	6	4	67	0.00023	0.00012	--	--	No	--	--	--	Yes
PCB-1260	63	48	76	1100	98	--	--	No	--	--	--	Yes
PPDDE	62	1	2	0.0049	0.0049	--	--	No	--	--	--	Yes

Table 20.1-3 Summary of Constituents Detected in SWMU 48 Soil Samples and Identification of COPCs

Constituent	Detection Frequency		Percent Detections	Maximum (ug/g)	EPC		ANOVA COPC	Essential Nutrient	Few De- tections > UTL	EPC Less Than RBSL*	Evidence of Histor- ical Use	Selec- ted as COPC
	No. of Samples	No. of Detections			95% UCL (ug/g)	UTL (ug/g)						
PPDDT	62	1	2	0.013	0.009	--	--	No	--	--	--	Yes
PeCDD	6	1	17	2.8E-05	1.4E-05	--	--	No	--	--	--	Yes
PeCDF	6	6	100	0.0054	0.0032	--	--	No	--	--	--	Yes
Potassium	29	29	100	2900	2200	7400	No	Yes	--	--	--	No
Prometon	1	1	100	0.32	0.32	--	--	No	--	--	--	Yes
Selenium	24	2	8	0.34	0.34	2.9	No	No	--	--	--	No
Sodium	29	29	100	850	620	11000	No	No	--	--	--	No
TCDD	6	2	33	1.5E-06	1.1E-06	--	--	No	--	--	--	Yes
TCDF	6	6	100	0.0031	0.0018	--	--	No	--	--	--	Yes
Thallium	29	21	72	30	17	35	No	No	--	--	--	No
Trichlorofluoromethane	1	1	100	0.0064	0.006	--	--	No	--	--	--	Yes
Vanadium	29	29	100	35	24	29	Yes	No	Yes	Yes	No	No
Zinc	29	29	100	160	45	59	No	Yes	--	--	--	No

\* Based on Region VIII criteria, the UCL must be strictly less than the carcinogenic RBSL and/or less than one-tenth of the noncarcinogenic RBSL.

- Chromium was detected in 100 percent of the soil samples with maximum and UCL95 concentrations of 52 µg/g and 16 µg/g, respectively. The UTL for chromium is 17 µg/g. One out of 29 chromium detections slightly exceeded the UTL by less than 3.1 times background. The residential soil RBSLs for chromium are 140 µg/g and 390 µg/g for carcinogenic and noncarcinogenic endpoints, respectively.
- Vanadium was detected in 100 percent of the soil samples with maximum and UCL95 concentrations of 35 µg/g and 24 µg/g, respectively. The UTL for vanadium is 29 µg/g. One out of 29 vanadium detections slightly exceeded the UTL by less than 1.2 times background. The residential soil RBSL for vanadium is 540 µg/g.

Toxicity profiles for these COPCs are provided in Appendix 1C. The ANOVA comparison identified two inorganic constituents, chromium and vanadium, as COPCs in soil (Table 20.1-3). Both chromium and vanadium were eliminated from further evaluation in the risk assessment because there is no evidence of historical use or disposal of these metals at SWMU 48, and their distribution showed no apparent spatial pattern; therefore, the few detections above the background UTL probably represent natural variation in the soil.

Three of the VOCs detected, acetone, bis(2-ethylhexyl) phthalate, and methylene chloride, are casual laboratory contaminants and may not be site related. The other organics detected in soil (dioxins, furans, solvent constituents, insecticides, agent breakdown products, explosives, and PCBs) are probably representative of the variety of wastes stored at this SWMU.

#### 20.1.5.2 Analysis

As required by UAC R315-101, this risk assessment approach evaluates potential health risks associated with both a residential and industrial use of SWMU 48. (Figure 4.1-1). The first step involved deriving RBSLs for a residential land-use scenario (Table 4.3-3) using the current RME and toxicological parameters recommended by EPA (Tables 4.3-1 and 4.4-1). The second step involved deriving RBSLs for an industrial land-use scenario (Table 4.3-4), which serves as a conservative approximation of actual use of this part of DPG.

No residential use of this area is planned. The purpose of the residential land-use analysis applied in the SWMU 48 baseline risk assessment is to address the requirements of

UAC R315-101, which contains corrective action decision-making criteria that relate directly to the residential-use risk estimate.

Under current site conditions, the most likely exposure scenario would actually involve infrequent visits by a site maintenance worker. Future industrial use of the site involving more frequent exposures is possible given its proximity to other operations at English Village. Therefore, the industrial-use evaluation serves as a conservative estimate of risk that could be associated with potential Army uses of the site.

#### 20.1.5.3 Risk Characterization

##### Residential Use Scenario

Table 20.1-4 summarizes the results of the risk assessment developed for exposures to SWMU 48 surface and subsurface soil under the residential land-use scenario.

As discussed in Section 4, RBSLs were not developed for MPA because toxicological data were not available. Subsequently, MPA risk or hazard values were not calculated in the human health risk assessment for SWMU 48. MPA is a by-product of the hydrolysis of nerve agents GB and VX. The fact that MPA is a product of a highly toxic parent does not imply that it is highly toxic itself. If ingested, MPA would be further hydrolyzed to methanol and phosphorous acid, which are not toxicologically significant based on the low concentrations reported in this risk assessment. Based on these end products, MPA would not significantly contribute to the total risk or hazard at this SWMU.

As discussed in Section 4, all of the dioxins and furans for SWMU 48 were evaluated as toxicity equivalents of TCDD. Individual congeners were normalized to the 2,3,7,8 substituted isomer of TCDD as opposed to evaluating total HpCDD, HpCDF, HxCDD, HxCDF, OCDD, OCDF, PeCDD, PeCDF, and TCDF. Comparing total dioxins and furans to individual congener RBSLs would overestimate risk because some congeners have a greater potential for adverse effects than others. The risk assessment methodology to evaluate dioxins and furans involved multiplying each congener concentration by a TEF value to obtain an equivalent concentration of TCDD. The TCDD-equivalent concentrations were summed for SWMU 48 and this concentration was compared to the RBSL for TCDD.

For soil, the total cancer risk and HI calculated for residential use of SWMU 48 are  $2.7 \times 10^{-3}$  and  $9.8 \times 10^{-4}$ , respectively (Table 20.1-4). The COPCs contributing to the cancer risk

Table 20.1-4 Results of SWMU 48 Soil Cancer Risk and Hazard Index Calculations for a Hypothetical Residential Land-Use Scenario\*

Cancer Risk

Chemical of Potential Concern	EPC (ug/g)	Cumulative RBSL (ug/g)	Ingestion Cancer Risk	Dermal Cancer Risk	Inhalation Cancer Risk	Chemical Cancer Risk	Chemical Percent of Total Risk
Bis(2-ethylhexyl) phthalate	0.1	2.2E+01	2.2E-09	2.4E-09	NC	4.6E-09	<1
PPDDE	0.0049	9.0E-01	2.6E-09	2.9E-09	NC	5.5E-09	<1
PPDDT	0.009	8.9E-01	4.7E-09	5.3E-09	1.1E-10	1.0E-08	<1
Methylene chloride	0.016	6.0E+00	1.9E-10	2.1E-10	2.3E-09	2.6E-09	<1
PCB-1260	98	4.0E-02	1.2E-03	1.3E-03	NC	2.5E-03	91
TCDD, equivalent	0.0005	2.0E-06	1.2E-04	1.3E-04	NC	2.5E-04	9
Pathway Total			1.3E-03	1.4E-03	2.4E-09		
Percent of Total			48	52	<1		
Total Cancer Risk						2.7E-03	

Hazard Index

Chemical of Potential Concern	EPC (ug/g)	Cumulative RBSL (ug/g)	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Chemical Hazard Quotient	Chemical Percent of Total HQ
Acetone	0.019	4.7E+03	2.4E-06	1.6E-06	NC	4.0E-06	<1
Bis(2-ethylhexyl) phthalate	0.1	9.6E+02	6.3E-05	4.2E-05	NC	1.0E-04	11
PPDDT	0.009	2.3E+01	2.3E-04	1.5E-04	NC	3.8E-04	39
Di-n-butyl phthalate	0.2	4.7E+03	2.6E-05	1.7E-05	NC	4.2E-05	4
Dimethyl disulfide	0.008	NC	NC	NC	NC	NC	NC
MEK	0.007	2.1E+04	1.5E-07	9.9E-08	9.3E-08	3.4E-07	<1
MPA	1.2	NC	NC	NC	NC	NC	NC
Methylene chloride	0.016	2.8E+03	3.4E-06	2.3E-06	NC	5.7E-06	1
Prometon	0.32	7.2E+02	2.7E-04	1.8E-04	NC	4.4E-04	45
Trichlorofluoromethane	0.006	1.4E+04	2.6E-07	1.7E-07	NC	4.3E-07	<1
Pathway Total			5.9E-04	3.9E-04	9.3E-08		
Percent of Total			60	40	<1		
Total Hazard Index						9.8E-04	

\* - This risk evaluation was developed using residential exposure parameters as required by the state of Utah administrative rules (UAC R315-101), but is based on the results of a sampling program that may not completely characterize all exposures that could result from residential use.

exceedance are PCBs and dioxins and furans. A cancer risk exceeding  $10^{-6}$  disqualifies the SWMU for risk-based closure (UAC R315-101).

#### Industrial Use Scenario

Table 20.1-5 summarizes the results of the risk assessment developed for potential exposures to SWMU 48 surface and subsurface soil for the industrial land-use scenario. The total cancer risk and HI calculated for this scenario are  $9.8 \times 10^{-4}$  and  $1.5 \times 10^{-4}$ , respectively. The cancer risk exceeds state of Utah criteria for corrective action (cancer risk of  $10^{-4}$  and HI of 1.0) so corrective action is required to remove PCB contamination. There is no use of shallow groundwater anticipated under current site conditions so groundwater was not evaluated.

It should be noted that even though the industrial cancer risk value exceeds  $10^{-4}$ , current on-site workers are not necessarily at immediate risk, as this human health risk assessment is based on public health concerns and should not be used to determine present occupational health limits.

#### 20.1.5.4 Summary

The results of the human health risk assessment indicate high risk posed to potential human receptors at SWMU 48 for both residential and industrial land uses. However, risks associated with current site use (corresponding to minimal human exposure) would actually be lower than those estimated for the industrial land-use scenario. Based on UAC 315-101 and the decision framework illustrated in Figure 4.1-1, these risk results require corrective action for this SWMU to reduce the potential risk. Should this area ever be released for an alternate use, the risk associated with the alternate use will be evaluated.

#### 20.1.6 Ecological Risk Assessment

SWMU 48 is located along the southern slope of the southeastern edge of the Cedar Mountains in an area characterized as a grassland community; juniper is commonly found along the slopes. Unique to this SWMU is the presence of a significant stand of trees located directly to the west of the facility fence. These trees were once associated with a mobile home trailer park. The area contained within the SWMU is completely covered with gravel. It should be noted that animals observed at this site were likely drawn by the stand of trees into the surrounding area and not by the conditions within the SWMU. Animals observed during at least one of the four seasonal field surveys included coyote, prairie falcon, great horned owl, mourning dove, red-shafted flicker, yellow-bellied sapsucker, western wood pewee, raven, American robin, European starling, yellow-rumped warbler, western meadowlark, common grackle, house finch, dark-eyed junco, and

Table 20.1-5 Results of SWMU 48 Soil Cancer Risk and Hazard Index Calculations for a Hypothetical Industrial Land-Use Scenario

Cancer Risk

Chemical of Potential Concern	EPC (ug/g)	Cumulative RBSL (ug/g)	Ingestion Cancer Risk	Dermal Cancer Risk	Inhalation Cancer Risk	Chemical Cancer Risk	Chemical Percent of Total Risk
Bis(2-ethylhexyl) phthalate	0.1	6.0E+01	2.4E-10	1.4E-09	NC	1.7E-09	<1
PPDDE	0.0049	2.5E+00	2.9E-10	1.7E-09	NC	2.0E-09	<1
PPDDT	0.009	2.4E+00	5.3E-10	3.1E-09	6.4E-11	3.7E-09	<1
Methylene chloride	0.016	1.1E+01	2.1E-11	1.2E-10	1.3E-09	1.5E-09	<1
PCB-1260	98	1.1E-01	1.3E-04	7.5E-04	NC	8.9E-04	91
TCDD, equivalent	0.0005	5.4E-06	1.4E-05	7.9E-05	NC	9.3E-05	9
Pathway Total			1.5E-04	8.3E-04	1.4E-09		
Percent of Total			15	85	<1		
Total Cancer Risk						9.8E-04	

Hazard Index

Chemical of Potential Concern	EPC (ug/g)	Cumulative RBSL (ug/g)	Ingestion Hazard Quotient	Dermal Hazard Quotient	Inhalation Hazard Quotient	Chemical Hazard Quotient	Chemical Percent of Total HQ
Acetone	0.019	3.0E+04	9.5E-08	5.4E-07	NC	6.4E-07	<1
Bis(2-ethylhexyl) phthalate	0.1	6.0E+03	2.4E-06	1.4E-05	NC	1.7E-05	11
DDT	0.009	1.5E+02	9.0E-06	5.0E-05	NC	5.9E-05	38
Di-n-butyl phthalate	0.2	3.0E+04	1.0E-06	5.7E-06	NC	6.7E-06	4
Dimethyl disulfide	0.008	NC	NC	NC	NC	NC	NC
MEK	0.007	6.4E+04	5.8E-09	3.3E-08	7.0E-08	1.1E-07	<1
MPA	1.2	NC	NC	NC	NC	NC	NC
Methylene chloride	0.016	1.8E+04	1.3E-07	7.6E-07	NC	9.0E-07	1
Prometon	0.32	4.5E+03	1.0E-05	6.0E-05	NC	7.1E-05	46
Trichlorofluoromethane	0.006	9.3E+04	9.8E-09	5.5E-08	NC	6.4E-08	<1
Pathway Total			2.3E-05	1.3E-04	7.0E-08		
Percent of Total			15	85	NC		
Total Hazard Index						1.5E-04	

white-crowned sparrow. Animals observed in grassland habitats throughout DPG are identified in Table 1.1-2.

The ecological COPCs for all DPG SWMUs include cadmium, copper, lead, manganese, mercury, PPDDT, and zinc. During the screening-level ERA, low ( $HQ < 10$ ) and moderate ( $10 < HQ < 100$ ) potential risk was determined at SWMU 48 for arthropods from mercury and lead, respectively. Cadmium, copper, manganese, and zinc are not considered in this closure plan (although risks may have been determined during the screening-level ERA) because the mean concentrations of these COPCs at SWMU 48 were determined to be at or below DPG background levels (Section 5.3.1).

The results of the comprehensive ERA show that grid-block concentrations of manganese are at or below background levels within the SWMU and its buffer zones. The mean and range HQ values for the remaining evaluated combinations are as follows:

COPC/Receptor	Within SWMU HQ	100-ft Buffer HQ	200-ft Buffer HQ
	Mean (Range)	Mean (Range)	Mean (Range)
Mercury/arthropod	<b>1.7</b> (1.4–2.5)	<b>1.6</b> (1.5–2.0)	<b>1.6</b> (1.5–1.8)
Lead/arthropod	<b>2.2</b> (0.9–3.3)	<b>1.5</b> (1.0–2.6)	<b>1.3</b> (1.1–1.6)
Zinc/plant	N/A	N/A	<b>1.2</b> (1.1–1.4*)

\* The maximum value of risk in this range is 0.02 greater than risk resulting from background concentrations.

Within the SWMU proper, the HI value, which is based on mean HQs, is 3.9 for arthropods because of mercury in the northwest portion of the SWMU and the buffers and lead distributed throughout the entire SWMU and sporadically in each buffer. The distribution of zinc is similar to that of lead. In light of the low magnitude of potential risk determined, level of development, and current use of the site, no remedial actions are proposed for this SWMU on the basis of the ERA. However, if remedial efforts are deemed necessary for other reasons, disturbance to



associated habitats should be minimized, particularly to the large stand of trees outside the fence to the west, which provides a relatively exceptional habitat.

#### 20.1.7 Maximum Waste Inventory

SWMU 48 was used as a storage facility for various material and equipment including, but not limited to, DS2 decontamination solution, unused agent samplers, waste petroleum products, lubricants and solvents, glycol, paints, transformers, nickel-cadmium batteries, asbestos contaminating materials, and 3X material and equipment. Material and equipment were stored in the gravel yard and in the buildings located at the SWMU. The total area of SWMU 48 is 350 ft by 250 ft, which includes two storage buildings, Building 6040 with dimensions of 20 ft by 35 ft and Building 6042 with dimensions of 30 ft by 100 ft.

### 20.2 CLOSURE PERFORMANCE STANDARD

This closure plan is designed to provide for closure of SWMU 48 in a manner that will (1) protect human health and the quality of the environment; (2) control, minimize, or eliminate the escape of hazardous constituents to soil, surface water, groundwater, or the atmosphere during and after closure; and (3) minimize the need for further maintenance at the SWMU. These objectives are consistent with the Army objectives of protecting human health and the environment under continued military use of DPG.

UAC R315-101 provides the decontamination criteria for contaminated soil and groundwater at the unit to the extent necessary to protect human health and the environment when remediation or removal of hazardous constituents to background levels will not be achieved. According to R315-101-6, the need for corrective action or continued management of the unit after closure is based on the following risk assessment criteria:

- No corrective action is necessary if the carcinogenic risk is less than  $1 \times 10^{-6}$  for residential use and the noncarcinogenic HI is less than 1.0.
- Site controls (or optional corrective action) are required if the carcinogenic risk is greater than  $1 \times 10^{-6}$  for residential use and less than  $1 \times 10^{-4}$  for actual use. The noncarcinogenic HI must be less than 1.0 for both residential and actual use.
- Corrective action is required if carcinogenic risk is greater than  $1 \times 10^{-4}$  or the noncarcinogenic HI is greater than 1.0 for actual use.

There are no administrative rules regarding cleanup on the basis of the ecological risk assessment. Site-specific conditions will be considered in evaluating the requirements of corrective action during the closure with respect to ecological risk.

In addition, corrective action decision-making criteria must take into account the principle of nondegradation of the environment as required in UAC R315-101-3. According to this rule, the unit is to be managed and closed in a way that prevents an increase in the levels of contamination in groundwater, surface water, soil, and air during and after closure of the unit.

Any hazardous constituents or hazardous wastes released from the unit to environmental media will be properly controlled to protect human health and the environment or will be remediated to health-based or background or groundwater protection standard target cleanup levels.

The two major contaminants of concern are PCBs and dioxins/furans. PCBs are regulated under the Toxic Substances Control Act (TSCA) and RCRA (for chlorinated compounds of more than 1,000 ppm). TSCA covers the management, handling, marking, storage, and disposal of PCBs at concentrations of 50 ppm or greater. TSCA spill cleanup policy provides cleanup levels and procedures for spills that have occurred after May 4, 1987. The cleanup policy recommends a cleanup level of 25 ppm for restricted areas and 10 ppm for unrestricted areas. The operation of the SWMU began in 1950. It is not known when the spill occurred and from what source(s) it came.

The risk assessment calculated that a cleanup level of 10 ppm will result in a  $1 \times 10^{-4}$  risk (industrial-use scenario), which meets the UAC R315-101 requirements. The risk calculations are conservative and have been made with the assumption that the workers would be on site 250 days a year and 8 hours daily. The actual risk will be much lower because the exposure frequency will be much lower.

There is no regulatory cleanup level for dioxins and furans. The cleanup levels will be derived from the risk assessment. A cleanup level of 1 ppb (TEQ of 3,3,7,8-TCDD) will result in a risk level of approximately  $1 \times 10^{-4}$  (industrial-use scenario) based on the risk assessment. Again, the actual risk may be much lower because of the lower exposure frequency than the duration assumed in the calculations.

## 20.3 CLOSURE ACTIVITIES

The corrective measures that must be implemented to remediate SWMU 48 are described below.

The elements of the corrective measure are as follows:

- Structure demolition
- Surface decontamination
- Excavation of soil
- Disposal of soil and debris

These measures are required based on the site and contaminant characteristics discussed above, the risk assessment results for human health and ecological life detailed in Sections 20.1.5 and 20.1.6, and compliance with regulatory requirements. Table 20.3-1 summarizes the risk assessment results and corrective action recommendations for closure of the unit. DPG intends to use the area of SWMU 48 as a storage yard in the future for storage of materials other than hazardous waste.

### 20.3.1 Facility Decontamination

Media to be removed or decontaminated include soil, structures, and equipment, as discussed in the following paragraphs.

#### 20.3.1.1 Structures and Equipment Decontamination

The presence of agent breakdown products on wipe samples taken from Buildings 6040 and 6042 during Mobilization 2 requires that remedial action measures be implemented. Building 6040 is constructed of wood, which is difficult to decontaminate because of its porosity. Therefore, the two-story structure will be demolished during closure activities if toxicity data is not available at that time. However, the floor will not be removed because testing of the concrete foundation has shown that it is not contaminated with agent breakdown products and it does not meet the requirements of a RCRA-characteristic hazardous waste. A ramhoe will be used to dismantle the building, and workers will further disassemble the debris and rubble.

Building 6042 is also contaminated with agent breakdown products; concrete boring samples show that the building's foundation is not contaminated. Because DPG plans to continue using this building for storage, signs will be posted on all entrances stating "BUILDING CONTAMINATED WITH CHEMICAL AGENT BREAKDOWN PRODUCTS—FOR INFORMATION CONTACT ENVIRONMENTAL PROGRAMS OFFICE, EXT 3730." When toxicity data is available, the need for decontamination at Building 6042 will be reevaluated.

Table 20.3-1 Corrective Action Requirements and Recommendations  
for SWMU 48

Risk Assessment Criteria		Cancer Risk	Noncancer Hazard Index	Target Organ	Recommendation
<b>Human Health</b>					
Residential	Soil	2.70E-03	0.00098		
	Groundwater	No groundwater contamination expected			
	Total	2.70E-03	0.00098		Clean closure not allowed
Actual (Industrial)	Soil	9.80E-04	0.00015		Corrective action required
		Low risk			No corrective action required
<b>Ecological</b>					
<b>Other Considerations</b>		<b>Assessment Results</b>		<b>Recommendation</b>	
Explosive Hazard	Surface	None observed			
	Subsurface	None expected			No corrective action required
Nondegradation of the Environment		No degradation expected			No corrective action required
<b>Proposed Corrective Action</b>					
Install warning signs at buildings with agent product detections Decontaminate or dispose of structural materials in accordance with Remove soil contaminated with PCBs, dioxins, and furans. Apply controls on land use or reevaluate risk assessment when toxicity data are available for agent breakdown products					

#### 20.3.1.2 Soil Decontamination

The sampling results indicate soil at SWMU 48 is contaminated with PCBs. The elevated PCB concentrations are from samples collected primarily around the former transformer pad as well as from an area (approximately 180 ft) between the former transformer storage site and Building 6016. Additional sampling is currently being conducted to further delineate the contamination.

Sample results also reveal dioxins and furans to be present in the same areas described above at a depth of 1 ft. In addition to these contaminants, MPA, an agent breakdown product, was detected primarily around the former 3X storage area south of the transformer pad and in the western portion of the yard.

Based on this information, it will be necessary to excavate portions of SWMU 48 that contain this contaminated soil. Currently, the Army is conducting additional sampling to complete the delineation of PCBs at this unit. Based on the results of the additional sampling, the Army will select one of two possible cleanup levels for PCBs. However, the HWMU 48 closure will meet the standards of R315-101. A PCB cleanup level of 1 ppm will be used if the Army wishes to achieve clean closure or 25 ppm if restrictions on future site uses are to be applied. When a cleanup level is selected, a separate work plan will be prepared and submitted to the state before corrective action begins. This plan will include details of closure as outlined in the Executive Summary. Although the excavation volume estimates are subject to change based on the selected cleanup level and the results of the 1997 sampling event, the soil will initially be excavated to a 1-ft depth over an area of approximately 1 acre. Excavation of the most heavily contaminated area will occur in 1-ft lifts (Figure 20.3-1), and confirmatory sampling will be conducted concurrently on the remaining soil. Engineering control measures, such as water spraying, will be used to control fugitive dust emissions. A combination of field-screening sample kits and laboratory samples for verification of the field data will be used in this activity. A sampling grid will be established in the corrective action work plan. The workplan will also outline the number of confirmatory samples to be sent to the laboratory for analysis. The laboratory samples will be analyzed for PCBs, metals, chemical agent breakdown products, and dioxins/furans using EPA methods.

After the first 1-ft layer of soil is removed, the sampling results from the screening kits will be immediately analyzed to determine whether the remaining soil is above or below the established

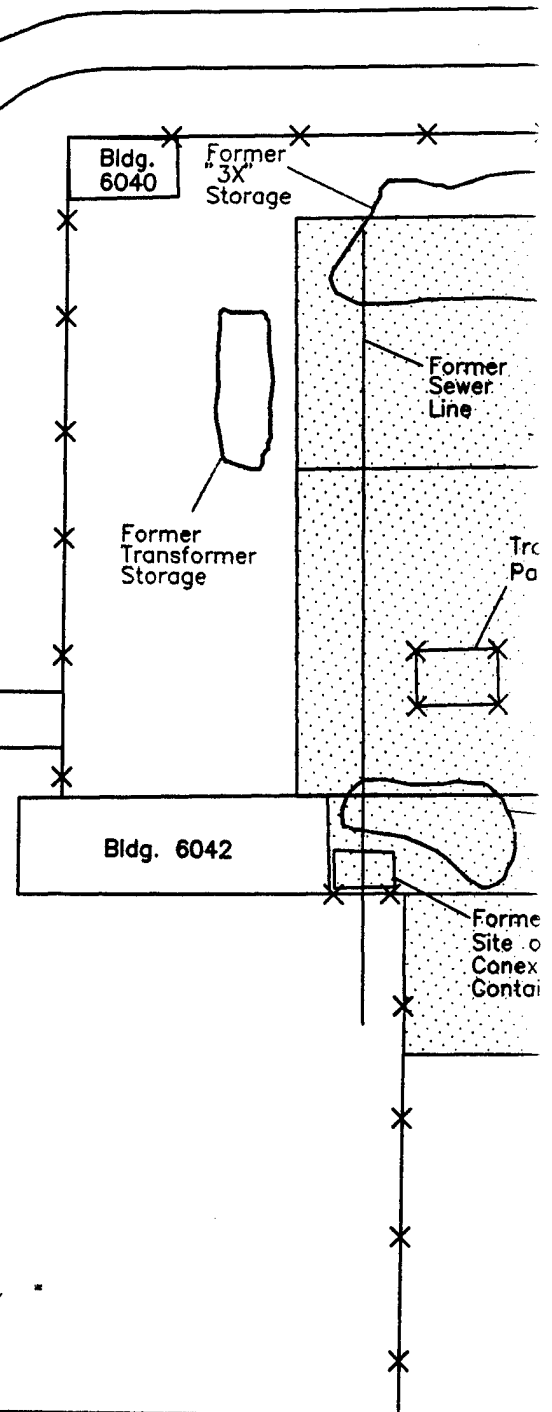


For Excavation:

A - 240' x 78'  
B - 156' x 102'  
C - 144' x 30'  
D - 120' x 50'

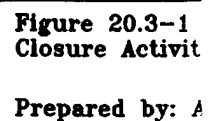
Total Area = 44,952 sq. ft.

⊙ 1.0' excavation = 44,952 cu. ft. ~ 166



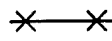
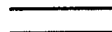
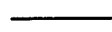



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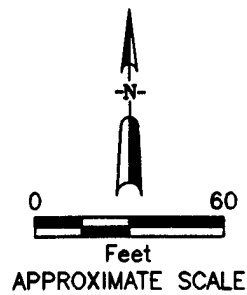
4,952 cu. ft. ~ 1665 cu. yd.



3

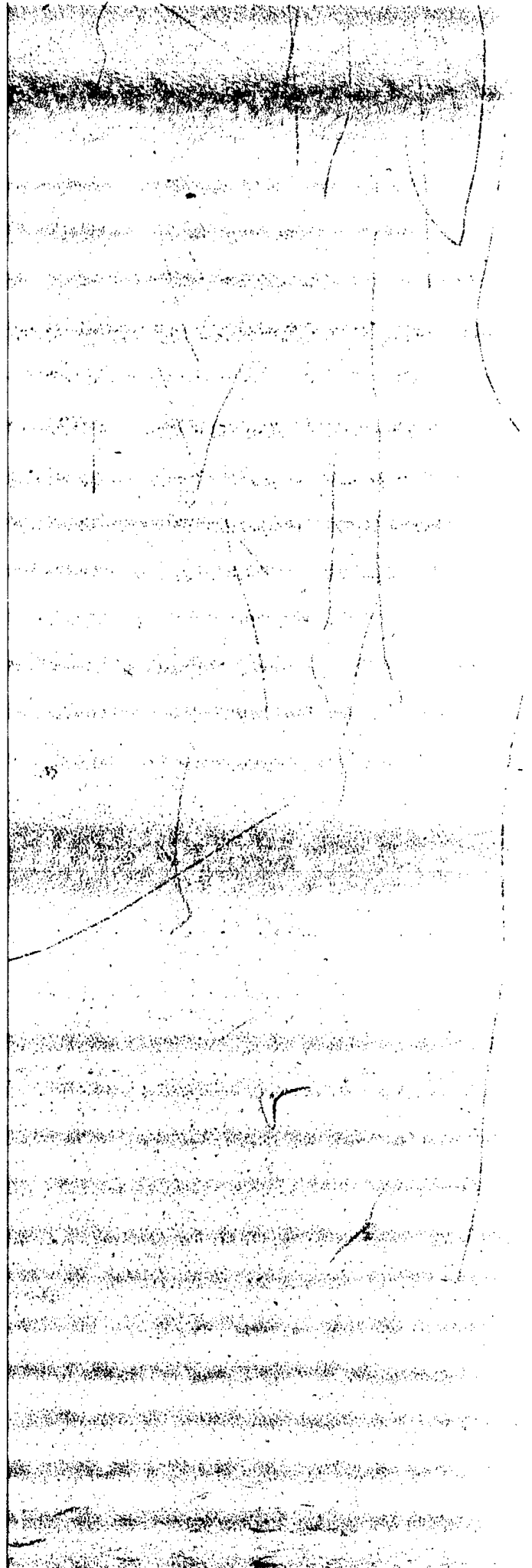
# LEGEND

-  Fence
-  Dirt/Gravel Perimeter Road
-  Asphalt Road
-  Buried Piping (Plugged)
-  Building
-  Area to be Excavated



**Figure 20.3-1 SWMU 48  
Closure Activities**

**Prepared by: Ageiss Environmental, Inc.**





cleanup level. If the remaining soil is below the cleanup level, then the excavation is complete. Any areas exceeding the cleanup levels will require further excavation. Another 1-ft soil layer will be excavated from those areas exceeding the cleanup levels. The same confirmatory sampling procedure as discussed above will be conducted on those areas. This process will continue until the risk based closure standards of R315 are achieved. The laboratory verification samples will be analyzed as quickly as possible in an attempt to allow closure activities to continue in a timely and cost-effective manner.

The resulting excavation will be backfilled and graded with clean native soil from a source within the installation. The exact location of the borrow area(s) will be decided in coordination with the DPG Directorate of Public Works prior to the beginning of construction activities.

A backhoe will be used to excavate the PCB- and dioxin/furan-contaminated soil. These soils will then be transported to a temporary staging area. A temporary staging area will be constructed of a durable synthetic membrane supported by railroad ties. The soil will be placed into DOT-approved roll-off bins. Following containerization, the removed soil will be hauled to an on-site storage facility prior to transport to an approved, off-site hazardous waste management facility for final disposal. Details will be provided in a workplan.

Although agent breakdown products were not detected in Mobilization 3 soil samples, these contaminants were detected in samples from several locations during Mobilization 2. These samples were collected from varying depths, including the 3-ft to 4-ft interval. Because of the depth and random distribution of this contamination at the site, additional soil samples will be collected between known detection sites to determine vertical and areal extent of agent breakdown product contamination. The feasibility of excavating the agent breakdown product contamination will be evaluated at that time. If practical, the contaminated soil will be removed and disposed of off site. The excavation will be filled with clean fill from a borrow area on DPG. The clean native soil and the existing gravel cover will be compacted to achieve 90-percent Modified Proctor compaction. The surface of the soil should be graded to control the flow of surface water and to reduce water infiltration. Details will be provided in a workplan.

After closure has been completed, contaminated materials from the temporary staging pad will be removed and transported in covered dump trucks or roll-off bins to an approved off-site hazardous waste management facility.

### 20.3.2 Groundwater Monitoring

At this time, Dugway does not anticipate that groundwater monitoring will be needed. However, a final decision about the need for groundwater monitoring will not be made until the results of the 1997 sampling event are evaluated. The 1997 sample results will be presented in the detailed workplans. If necessary, wells will be installed and groundwater will be sampled.

### 20.3.3 Evaluation of Closure Activities

The proposed closure activities are evaluated against three criteria: effectiveness, reliability, and implementability. The first criterion focuses on the effectiveness of the closure activities in meeting the closure performance standards presented in Section 20.2, which include the protection of human health and the environment and compliance with regulatory requirements. The reliability criterion evaluates the long-term performance of the remedy with respect to the conditions at the site. Implementability is a measure of both the technical and administrative feasibility of constructing, maintaining, and operating the remedial measures.

#### Effectiveness

Structures demolition and disposal will reduce the risk by preventing exposure through source removal. Site controls including warning signs restrict access to Building 6042. Excavation of contaminated soil will further reduce the risk for direct exposure.

#### Reliability

Removal of contaminated materials provides a permanent solution. Demolition and decontamination of structures will be performed using proven technologies.

#### Implementability

Structures demolition and soil excavation can be easily implemented using proven technologies. Disposal facilities are available within Tooele County. Testing will be necessary to select decontamination solutions.

At the time of preparation of this decision document, Dugway had not completed a statistical evaluation of background levels. Closure will not be considered complete, and excavated areas will not be backfilled until background levels are approved by the state, and metals results from confirmation samples are compared with the background levels.

#### 20.3.4 Ancillary Closure Activities

Several ancillary activities involving runoff/runoff control and security measures will be conducted during closure operations at SWMU 48.

##### 20.3.4.1 Runon and Runoff Control

No additional runoff/runoff controls will be necessary in the post-closure period.

##### 20.3.4.2 Security

SWMU 48 is located within DPG, a federally owned facility that is secured by fences and gates. Therefore, access to the site is already restricted. However, during closure activities, a temporary fence will be constructed around the SWMU as an exclusion zone to prevent unnecessary installation personnel from accessing the work site.

##### 20.3.4.3 Dust Control

During excavation, fugitive dust will be controlled using engineering measures such as water spray. Fine mist water will be sprayed onto the excavated soil piles and the excavation areas. The amount of water should be controlled such that only the surface of the soil will remain moist but ponding and run-off should not occur. Details will be provided in a workplan.

#### 20.3.5 Survey Plat

A survey plat is not required as all wastes will be removed after closure.

#### 20.3.6 Certification of Closure

Within 60 days of completion of closure activities for SWMU 48, a closure certification will be submitted to the state. This certification will be signed by the Installation Commanding Officer of DPG and an independent, registered Professional Engineer stating that the unit has been closed according to the specifications in the approved closure plan.

Supporting documentation of the certification (e.g., Professional Engineer's inspection report and sample results) will be made available to the Executive Secretary, Utah Solid and Hazardous Waste Control Board upon request. At a minimum, the following information should be included:

- Activities conducted during inspections
- Field reports documenting each on-site visit

- List of in-house records that were reviewed (e.g., sampling data, laboratory results, contractor logs of activities performed, engineering drawings)

#### 20.3.7 Schedule for Closure

The closure of SWMU 48 will proceed on a general schedule that is dependent on several factors, including the DOD relative risk ranking of the unit, which determines funding availability, and the availability of toxicity data for agent breakdown products, which determines the disposition of waste from the SWMU. Once the final closure plan is approved by UDEQ and funds are allocated, the closure will be performed in stages, each of which will be separately funded. A detailed waste management plan will be prepared as part of a separate work plan that Dugway Proving Ground will submit to the state prior to commencing the corrective action. The closure of SWMU 48 involves two stages—a design phase, and a construction phase. The Army and UDEQ will develop the closure schedule to ensure the timely closure of the unit.

#### 20.4 POST-CLOSURE PLAN

Corrective measures at HWMU 48 may achieve clean closure according to R315-101. If clean closure is achieved, post-closure plans and a permit will not be required. If the detailed workplans, as outlined in the Executive Summary, specify anything except clean closure, Dugway will submit a post-closure permit application with the detailed closure plans. The permit application will include inspection, maintenance and monitoring plans and schedules.

#### 20.5 PERMIT MODIFICATION

After the public comment period ends and the Closure Plan for SWMU 48 is approved, this SWMU will be deleted from Part A and from Tables 1 and 2 in Module IV of the DPG permit.